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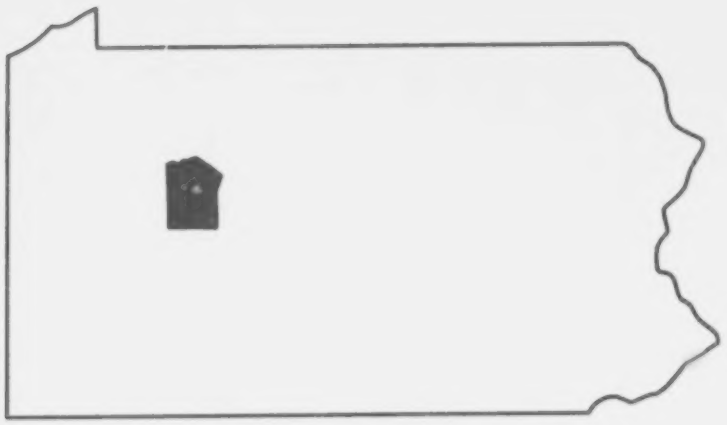
FLOOD INSURANCE STUDY

BOROUGH OF BIG RUN, PENNSYLVANIA
JEFFERSON COUNTY



JUNE 4, 1990

Federal Emergency Management Agency

COMMUNITY NUMBER - 420508

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision (LOMR) process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Initial Flood Insurance Study Effective Date: June 4, 1990

Flood Insurance Study Revised:

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FLOOD INSURANCE STUDY
BOROUGH OF BIG RUN, JEFFERSON COUNTY, PENNSYLVANIA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Borough of Big Run, Jefferson County, Pennsylvania, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by the Pittsburgh District of the U. S. Army Corps of Engineers (COE) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-85-E-1822, Project Order No. 1, Amendment No. 25. This work was completed in January 1988.

1.3 Coordination

On May 30, 1985, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA, the borough, and the COE (the study contractor) to determine the streams to be studied by detailed methods.

On July 12, 1989, a final CCO meeting was held with representatives of FEMA, the borough, and the study contractor to review the results of the study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Borough of Big Run, Jefferson County, Pennsylvania. The area of study is shown on the Vicinity Map (Figure 1).

Mahoning Creek and Big Run were studied by detailed methods for their entire lengths within the community. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction through January 1993.

Two unnamed streams were studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the Borough of Big Run.

2.2 Community Description

The Borough of Big Run is located in the southeast corner of Jefferson County, in central western Pennsylvania, approximately 70 miles northeast of Pittsburgh. It is bordered by the Township of Henderson to the west, north, and east; and by the Township of Gaskill to the south. The borough covers a land area of 1.1 square miles. The 1980 population was 822, representing a slight decrease from 826 in 1970 (Reference 1).

Mahoning Creek, with a total drainage area of 425 square miles at its mouth, joins the Allegheny River on the left bank at river mile 55.5 in the Township of Pine, Armstrong County, Pennsylvania. It flows towards the southwest from its source just upstream of the Borough of Big Run. The average bed slope of Mahoning Creek within the borough is approximately 8 feet per mile. Local relief above the stream varies from a low of 1,265 feet to an average hilltop elevation of 1,500 feet. The valley floor varies from 800 to 1,000 feet in width.

Big Run, with a total drainage area of 19.2 square miles at its mouth, joins Mahoning Creek on the right bank at creek mile 61.85, at the Borough of Big Run. It flows towards the south from its source near Panic. The average bed slope of Big Run within the borough is approximately 22 feet per mile. Local relief above the stream varies from a low of 1,265 feet to an average hilltop elevation of 1,500 feet. The valley floor varies from 200 to 500 feet in width.

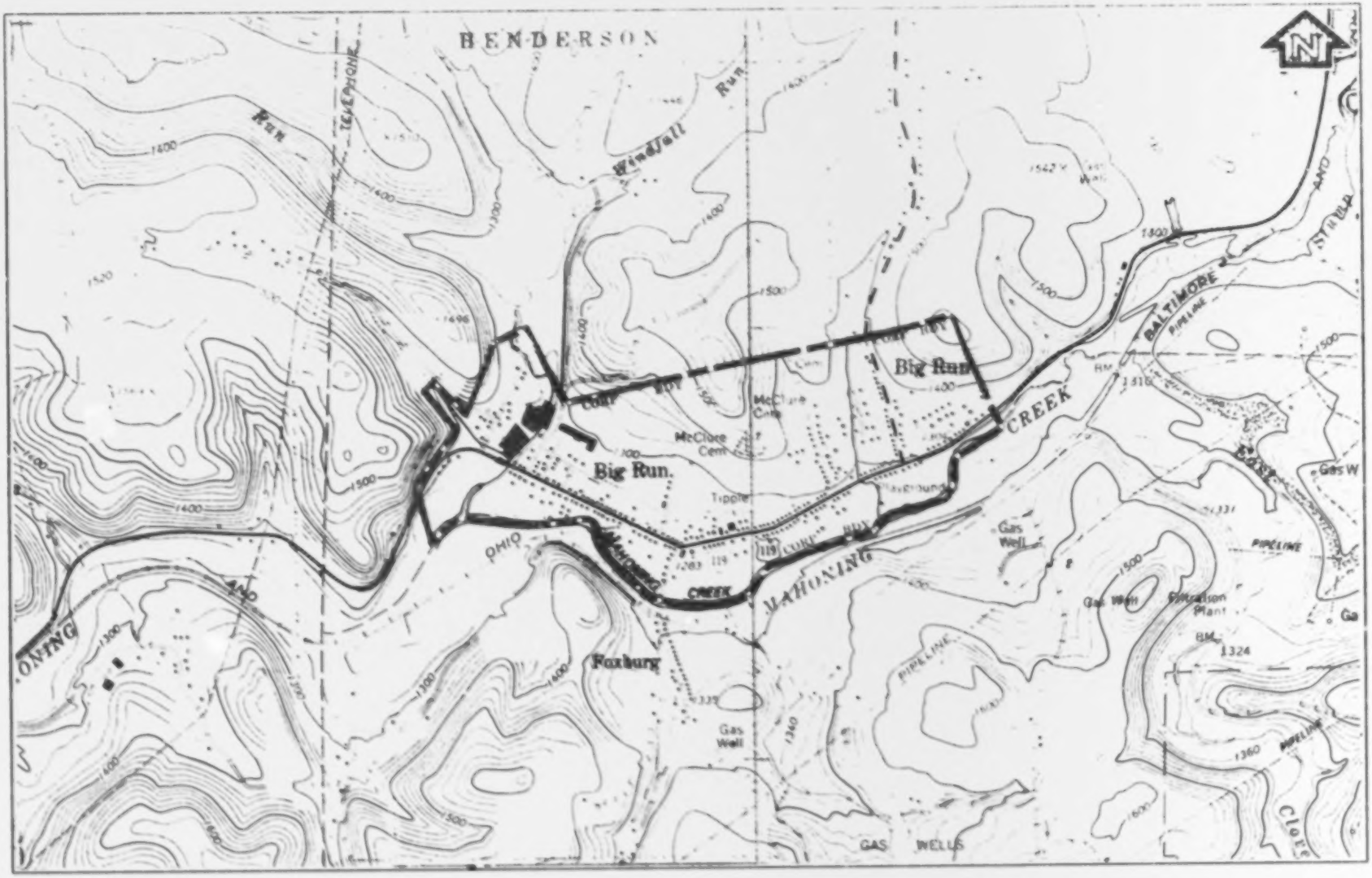


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

BOROUGH OF BIG RUN, PA

(JEFFERSON CO.)

APPROXIMATE SCALE

2000 0 2000 4000 6000 FEET

VICINITY MAP

The Borough of Big Run is geographically located in a region of both polar and tropical air mass activity, subjected to continental and maritime invasion. The weather is usually moderate, but may have occasional rapid changes resulting from frontal air mass movements. Temperatures range from highs of 90 to 99 degrees Fahrenheit (^{o}F) to a low below 0^{o}F, with an average of approximately 48^{o}F. Precipitation occurs throughout the year with an annual average of approximately 42 inches as measured by the National Weather Service precipitation gage in DuBois.

2.3 Principal Flood Problems

Major floods may occur along Mahoning Creek at various times of the year. Spring flooding is usually the result of heavy rain and snowmelt, which contributed to the large flood of March 1936. Summer flooding is usually the result of a short duration, high intensity storm such as the one which contributed to the July 1977 flood, the highest flood of record within the borough. The following tabulation shows major floods of record on Mahoning Creek as measured at the U. S. Geological Survey (USGS) recording gaging station (No. 03034000) located at Punxsutawney since 1938.

Date of Crest	Stage (feet)	Elevation (feet)	Discharge (cfs)
July 20, 1977	16.22	1,222.36	13,800
March 18, 1936	15.60*	1,221.74	12,500
June 23, 1972	15.10	1,221.24	12,300
March 10, 1964	13.60	1,219.74	10,500
February 24, 1975	12.10	1,218.24	8,500
July 15, 1958	10.89	1,217.03	7,300

*Gage height measured from high-water mark.

Major floods may occur along Big Run at various times of the year; however, the main flood period is usually during the spring and summer months. Due to its basin size, shape, and steep slopes, Big Run is more susceptible to flash flooding from high intensity, short duration thunderstorms than the typical rain-snowmelt, winter-spring storms.

2.4 Flood Protection Measures

A local flood protection project for Mahoning Creek within the Borough of Big Run was designed and built by the COE, and turned over to local interests in 1964. Improvement consisted of widening, deepening, realigning, and stabilizing the channel of Mahoning Creek for a distance of approximately 2.55 miles starting at approximately 0.9 mile downstream of the corporate limits and ending at the McCardy Road bridge. The project was designed to contain a flood equal to that of July 1958, which had estimated peak flows of 3,700 cubic feet per second (cfs) upstream of the confluence of Big Run and 4,500cfs downstream of the confluence of Big Run.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. A flood event of a magnitude which is expected to be equaled or exceeded once on the average during any 100-year period (recurrence interval) has been selected as having special significance for floodplain management and for flood insurance rates. This event, commonly termed the 100-year flood, has a 1 percent chance of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

There are no gage or flow records for Mahoning Creek within the Borough of Big Run; however, there is a USGS recording gage (No. 0304000) located approximately 11 miles downstream of the downstream corporate limits of the Borough of Big Run at Punxsutawney. Estimates of the 100-year frequency flood elevations on Mahoning Creek were developed through the use of past floods for which high-water marks, gaging station data, and discharge values are available and applicable to present conditions.

There are no gage or flow records for Big Run. The flow for the 100-year flood was developed using multiple regression formulas based on factors determined from a COE study of small streams in Pennsylvania (Reference 2). The factors used were drainage area, stream length, stream slope, and basin shape. For Big Run, the July 1977 high-water profile was used as the 100-year flood profile from the downstream corporate limits (mile 61.68) to mile 63.58. From mile 63.58 to the upstream corporate limits (mile 63.67), the COE HEC-2 step-backwater computer program was used to extend the 100-year profile.

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGE (cfs) 100-YEAR
MAHONING CREEK		
At Legislative Route 873 at Borough of Millheim	93.3	13,600
BIG RUN		
At confluence with Mahoning Creek	19.2	3,600

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross-sectional data were obtained by field measurement. All bridges were field surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1) and the Flood Insurance Rate Map (Exhibit 2) where applicable.

Water-surface elevations of floods of the selected recurrence intervals for the streams studied by detailed methods were computed using the COE HEC-2 step-backwater computer program (Reference 3). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations for Mahoning Creek were based on a rating curve at the McCardy Road Bridge, and starting water-surface elevations for Big Run were based at critical depth at its confluence with Mahoning Creek. The results of the floodway computations are tabulated for the selected cross sections (Table 2).

Channel roughness factors (Manning's "n") used in the hydraulic computations for Mahoning Creek and Big Run were assigned on the basis of field inspection and photographs, respectively. The channel "n" value for Mahoning Creek was 0.045, and the overbank "n" value was 0.080. For Big Run, the channel "n" value was 0.04, and the overbank "n" value was 0.08.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

FLOODING SOURCE		STREAM CHANNEL			LEFT OVERBANK			RIGHT OVERBANK			100 YEAR FLOOD WATER SURFACE ELEVATION FT (NGVD)
CROSS SECTION	DISTANCE (FT.)[1]	WIDTH (FT.)	DISCHARGE (CFS)	MEAN VELOCITY (FT./SEC.)	WIDTH (FT.)	DISCHARGE (CFS)	MEAN VELOCITY (FT./SEC.)	WIDTH (FT.)	DISCHARGE (CFS)	MEAN VELOCITY (FT./SEC.)	
A	300	74	3715	9.4	77	179	1.8	289	306	1.3	1281.8[2]
B	1,210	47	1504	3.6	53	159	0.97	421	2537	1.3	1281.8[2]
C	2,130	46	1592	5.4	0	0	0	429	2608	1.9	1281.8[2]
D	3,485	36	1798	8.1	237	1524	2.5	106	878	2.7	1284.0

[1] Stream Distance above confluence with Mahoning Creek

[2] Backwater from Mahoning Creek.

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

BOROUGH OF BIG RUN, PA

(JEFFERSON COUNTY)

REGULATORY DATA

BIG RUN

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100-year floodplain boundaries to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. For the streams studied in detail, the 100-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with a contour interval of 20 feet (Reference 4).

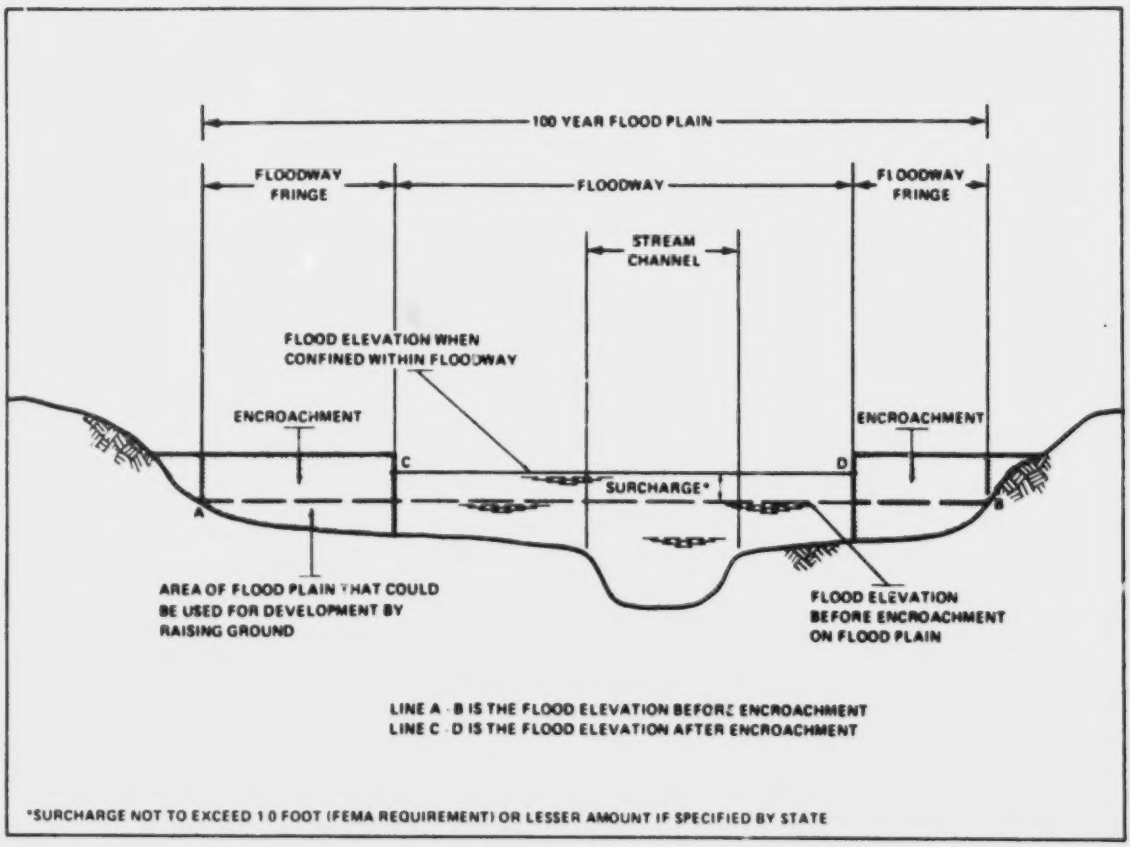
For the streams studied by approximate methods, the 100-year floodplain boundaries were delineated using the Flood Hazard Boundary Map for the Borough of Big Run (Reference 5).

The 100-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FLOODWAY SCHEMATIC Figure 2

No floodways were calculated as part of this study.

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100-year floodplain. The locations of selected cross sections used in the hydraulic analyses are shown where applicable.

7.0 OTHER STUDIES

A Flood Insurance Study is currently being prepared for the Township of Gaskill (Reference 6). The results of that study will be in agreement with the results of this study.

Because it is based on more up-to-date analyses, this study supersedes the Flood Hazard Boundary Map for the Borough of Big Run (Reference 5).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, Liberty Square Building (Second Floor), 105 South Seventh Street, Philadelphia, Pennsylvania 19106.

9.0 BIBLIOGRAPHY AND REFERENCES

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2. U. S. Army Corps of Engineers, Pittsburgh District, "Untitled Regression Data," Pittsburgh, Pennsylvania, 1975.

3. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, April 1984.

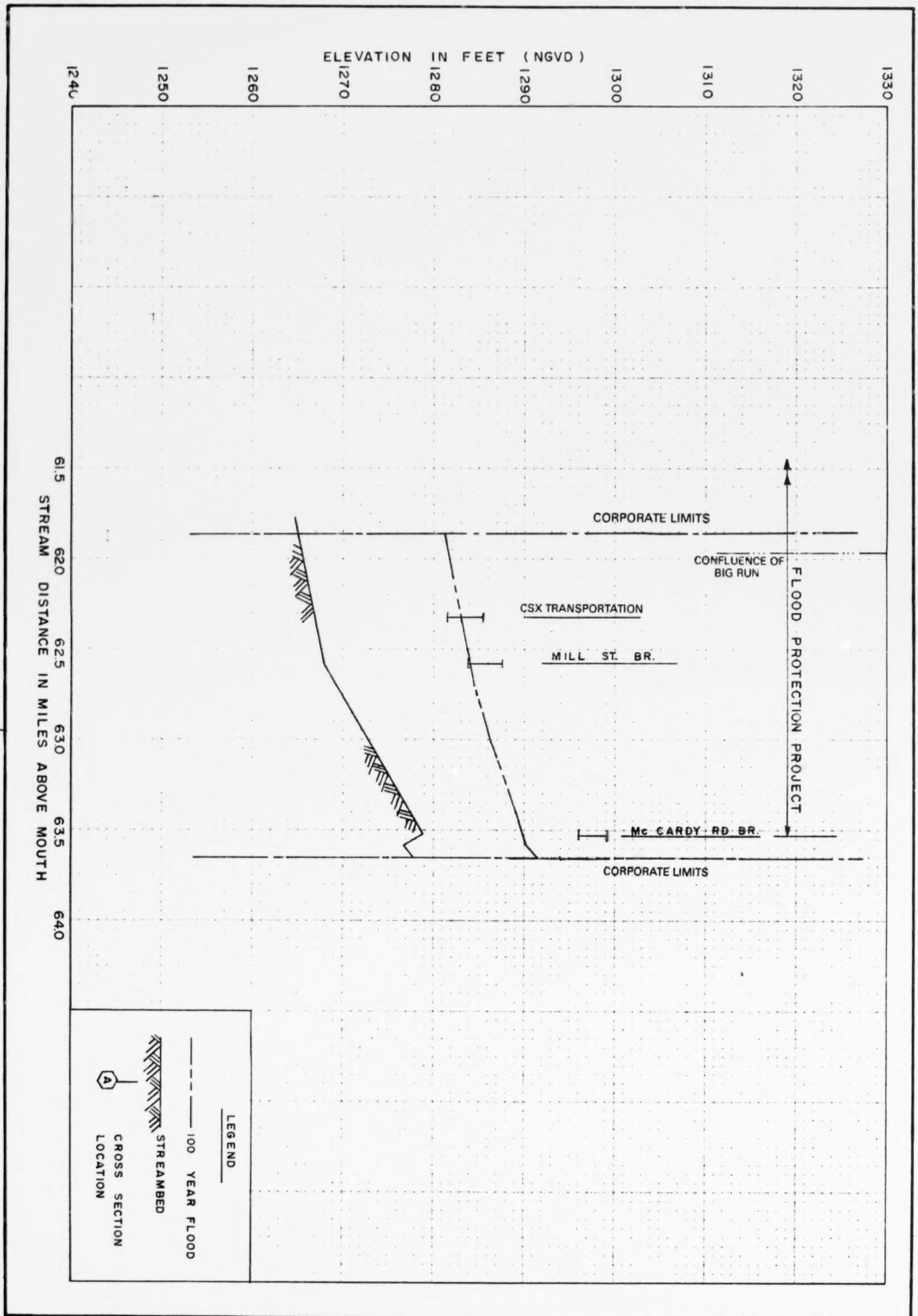
4. U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 Feet: Punxsutawney, Pennsylvania, 1973; and McGees Mills, Pennsylvania, 1973.

5. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Borough of Big Run, Jefferson County, Pennsylvania, June 4, 1976.

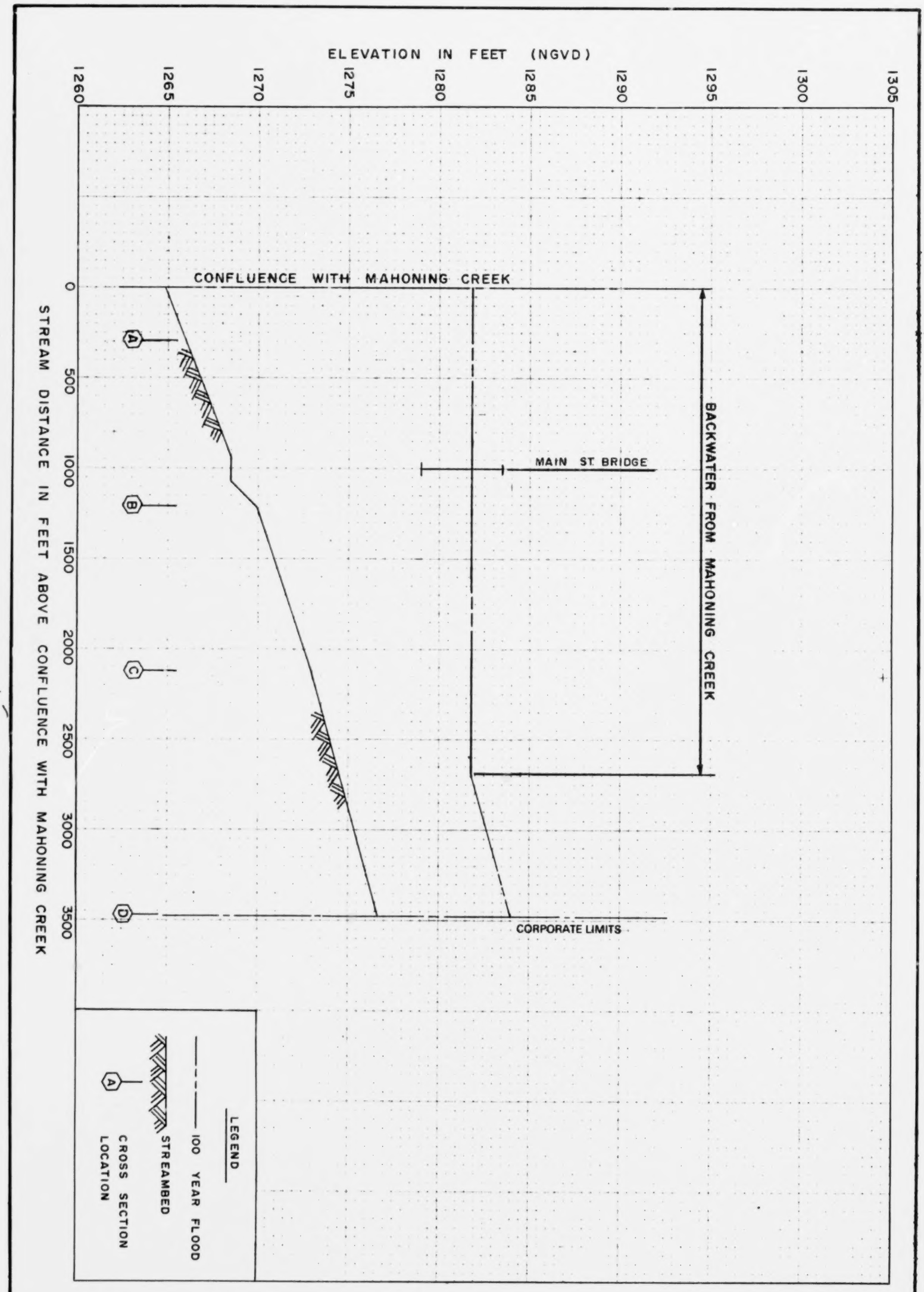
6. Federal Emergency Management Agency, Flood Insurance Study, Township of Gaskill, Jefferson County, Pennsylvania (Unpublished).

EXHIBIT 3 - ELEVATION REFERENCE MARKS

Reference Mark	Elevation (Feet NGVD)	Description of Location
RM 1	1,281.22	Chiseled square set on top of downstream left bank abutment of U. S. Route 119 bridge over Big Run.
RM 2	1,289.53	PDH disk set on top of upstream left bank wing wall of Mill Street bridge over Mahoning Creek.
RM 3	1,300.14	L cut set on top of downstream right bank retaining wall of McCardy Road bridge over Mahoning Creek, approximately 11 feet landward of end of bridge.



01P	FEDERAL EMERGENCY MANAGEMENT AGENCY BOROUGH OF BIG RUN, PA (JEFFERSON COUNTY)	FLOOD PROFILES MAHONING CREEK



02P

FEDERAL EMERGENCY MANAGEMENT AGENCY

BOROUGH OF BIG RUN, PA

(JEFFERSON COUNTY)

FLOOD PROFILES

BIG RUN